Incorporated Cavity Reflector and Parasitic Elements for Bandwidth Improvement of Circularly Polarized Crossed Dipole Antenna

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Circularly polarized (CP) antennas have been used extensively in wireless communication due to their capabilities of reducing polarization mismatch and their natural aid against multipath interferences [1]. Various antennas have been demonstrated to produce wideband CP operation, however, these antennas so far have limited CP bandwidths, and/or complex configurations that may require complicated fabrication process.

In this paper, a simple design of a CP crossed straight dipole antenna with bandwidth enhancement is presented. The main principle is to produce three adjacent CP bands. One of them is excited by the original crossed dipole while the others are generated by a cavity with an appropriate shape and a single parasitic element, respectively. To clarify, the main contribution of the paper is the principle of using two additional CP bands to achieve a significantly enhanced CP bandwidth.

The final prototype of the antenna, with an overall size of 90 × 90 × 31 mm^3 ($0.92\lambda_o \times 0.92\lambda_o \times 0.32\lambda_o$ at the center CP frequency 3.1 GHz), has been fabricated and measured to validate the proposed methods. The measurement results indicate that the proposed antenna achieves an impedance bandwidth for $|S_{11}| \leq -10$ dB of 75.2% (1.95–4.31 GHz) and 3-dB AR bandwidth of 67.7% (2.05–4.15 GHz). Furthermore, the antenna exhibits stable broadside radiation patterns which yield an average gain of approximately 8.3 dBi and an average front-to-back ratio of more than 15.7 dB over the entire CP band. Beside the antenna's good performance, it is also noted that the techniques used in this paper keep the antenna design simple, and therefore do not require extensive optimizations as well as complex fabrication process.

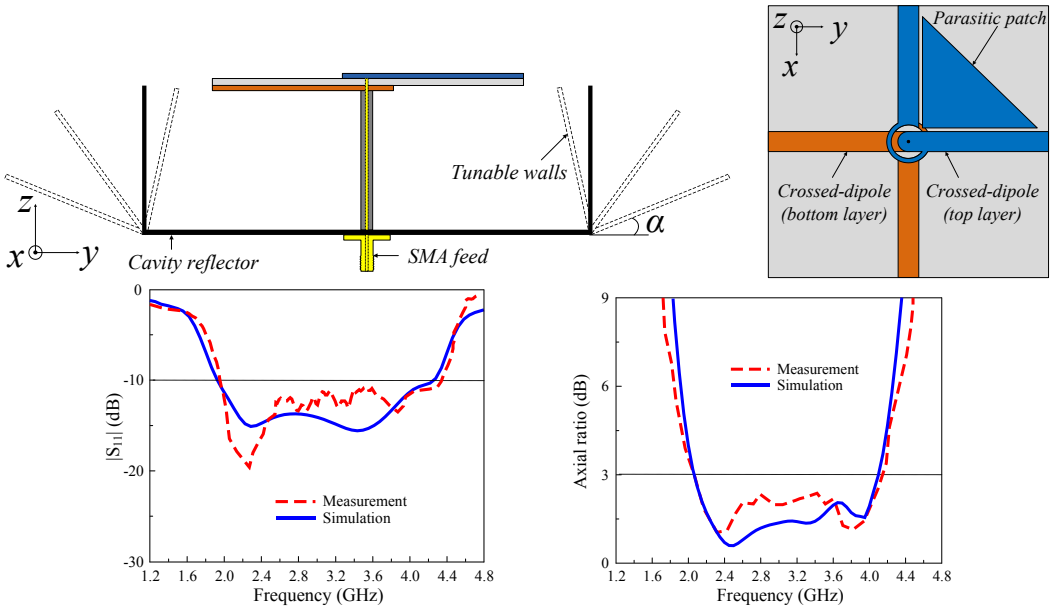

Figure 1. The proposed antenna design and its performance.

[1] T. Rappaport and D. Hawbaker, "Wide-band microwave propagation parameters using circular and linear polarized antennas for indoor wireless channels," *IEEE Trans. Commun.*, vol. 40, pp. 240–245, 1992.

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